ECONOMIC COMMENTARY

Interbank Exposure in the Fourth Federal Reserve District
by James B. Thomson

Contagion risk in the banking system — the sensitivity of a bank to the failure of another bank — is a source of public policy concern. It is especially a problem when the failure of one bank, or a limited number of banks, causes multiple failures in the banking system. Significant contagion effects have public policy implications both for the way banks are regulated and for the solvency of federal deposit insurance funds.

Research into the problem of contagion in the banking system has concentrated on two areas: the payment-system risk associated with daylight overdrafts and the implications of the exposure of a large number of U.S. banks to borrowers in a few foreign countries.[1] This analysis considers a third source of contagion risk in the banking system: the risk associated with banks holding assets in the form of claims against other banks (both domestic and foreign), which we refer to as *interbank exposure.*[2]

Interbank exposure may rise to the level of contagion risk because the failure of a bank is translated into losses at those banks whose asset portfolios include claims against the failing institution. These losses could be large enough to exhaust the claimant bank's capital, causing it to fail. It is not difficult to imagine a situation in which the failure of one medium-to-large bank could result in a chain of bank failures. In fact, the Federal Deposit Insurance Corporation (FDIC) used this very argument to justify the bailout of the Continental Illinois Bank and Trust Company of Chicago in 1984.[3]

In this *Economic Commentary,* we present arguments supporting two hypotheses: high levels of interbank exposure reduce the safety and soundness of the banking system, and interbank exposure affects the ability of the FDIC to use market discipline as a constraint on banks' risk-taking. In addition, we provide evidence that interbank exposure does not, at this time, appear to be a problem for banks in the Fourth Federal Reserve District.

Correspondent Banking and Interbank Exposure

We define interbank exposure as the assets one bank has at risk to another bank. In this study, the interbank-exposure items include cash items in the process of collection (CIPC), balances due from depository institutions (BDI), loans to depository institutions (LDI), acceptances of other banks (AOB), and federal funds sold and securities purchased with agreements to resell (FFS). We selected these items because they can be constructed from publicly available data. Recent innovations in banking may have created new categories of interbank exposure that should be included in future measures of such exposure, but those innovations, such as interest-rate and currency swaps, are either poorly measured by publicly available data or are not measured at all.

Note that CIPC and BDI, which make up our variable cash and balances due (CBDI), arise from correspondent banking relationships. Indeed, it is likely that correspondent banking is responsible for the lion's share of the interbank exposure accounted for by CBDI and for at least some of the interbank exposure represented by LDI, AOB, and FFS.

Correspondent banking is a market innovation that arbitrages away much of the inefficiency of a unit banking system. In fact, we would argue that the efficiency gains associated with correspondent banking may be responsible for the apparent lack of scale economies in banking.[4] Two types of banks are involved in a correspondent banking relationship: correspondent banks (usually small banks) and respondent banks (usually large banks). The correspondent bank can obtain services, such as check clearing and computer services, from its respondent bank at a lower cost than by performing those functions itself. In addition, a respondent bank can provide its correspondent bank with a source of increased portfolio diversification through loan participations.

In return for the services provided by the respondent bank, the correspondent keeps non-interest-bearing balances at its respondent bank as a form of implicit payment for the services it receives. Correspondent banks also keep cash balances at respondent banks, which provide their check-clearing services as a reserve

1. See E.J. Stevens, "Reducing Risk in Wire Transfer Systems," *Economic Review*, Federal Reserve Bank of Cleveland, Quarter 2 1986, pp. 17-22; and Jack M. Guttentag and Richard J. Herring, "Disaster Myopia in International Banking," *Essays in International Finance*, no. 164, Princeton University, September 1986.

2. For a discussion of the historical relationship between interbank exposure and financial distress, see Walker F. Todd, "The Historical Relationship Between Rising Interbank Exposure and Financial Distress," unpublished manuscript, Federal Reserve Bank of Cleveland, July 1987.

3. See Irvine H. Sprague, *Bailout: An Insider's Account of Bank Failures and Rescues*. 1986: Basic Books, Inc., New York.

account against which they can debit checks drawn on the correspondent bank or credit checks payable to the correspondent.

To the extent that interbank exposure arises from normal correspondent relationships, the benefits associated with increased efficiency of the banking system usually outweigh the risks associated with interbank ties. Indeed, if properly managed, much of the interbank-exposure risk faced by a correspondent bank can be diversified away by setting up multiple correspondent banking relationships. This practice limits the exposure of the correspondent bank to any one respondent bank, and it limits the replacement costs of establishing new correspondent banking relationships should one of its respondent banks fail.

Interbank Exposure and Federal Deposit Insurance

Interbank exposure can increase the risk exposure of the FDIC in two ways. First, it reduces the independence of bank failures. That is, it increases the probability that the failure of bank A will be accompanied by the failure of banks B, C, and D. Second, it reduces the FDIC's ability to close and dispose of insolvent banks in a manner that does not protect stockholders and uninsured creditors. High levels of interbank exposure can force the FDIC to adopt a policy of full or partial forbearance toward a failing bank's uninsured creditors and stockholders.

If bank failures are independent events, the risk exposure of the FDIC's insurance fund from any single bank is the expected value of losses should the bank fail, multiplied by the probability that the bank will fail. That is, the FDIC's risk exposure to a bank is a function of the riskiness of the bank's portfolio. However, if contagion effects (such as interbank exposure) cause bank failures to be nonindependent events,

then the risk exposure of the FDIC's insurance fund from a single bank is a function of both the riskiness of the bank's assets and the degree of contagion in the banking system. In such a scenario, the cost to the FDIC of bank A's failure includes any losses to the FDIC from banks that fail as a result of bank A's failure.

Therefore, it is clear that interbank exposure increases the risk to the FDIC from a single bank. Because contagion effects are one form of risk that the FDIC cannot diversify away in its portfolio, interbank exposure increases the total risk exposure of the FDIC to the banking industry.

The second undesirable effect of interbank exposure is its effect on the FDIC's ability to dispose of failed institutions without extending forbearances to uninsured creditors and stockholders. The FDIC is faced with a set of constraints that may prevent it from closing an insolvent bank: information and staff constraints, the implicit and explicit reserves of the FDIC's insurance fund, and political and legal constraints.[5] It is clear that an increase in interbank exposure (and contagion in general) increases the severity of each of these constraints. For example, with high levels of interbank exposure, the information the FDIC needs to close an insolvent institution includes the condition of the institution and the impact of its failure on other banks.

To find a leading example of how interbank exposure affected the way a failing bank was handled by the bank regulators, one has to look back no further than July 1984, when concerns about interbank claims played a role in the decision to bail out Continental Illinois Bank and Trust Company of Chicago (Continental). In testimony before the House Banking Committee's Subcommittee on Financial Institutions, Supervision, Regulation and Insurance, then-FDIC Chairman William Isaac stated that one factor that prompted the bailout of Continental was the FDIC's concern about the impact Continental's failure would have on small banks with interbank exposure to Continental. Isaac

states, "Hundreds of small banks would have been particularly hard hit. Almost 2,300 small banks had nearly $6 billion at risk in Continental; 66 of them had more than their capital on the line and another 113 had between 50 and 100 percent."[6]

But was Isaac's statement correct? Later analysis showed that it was unlikely that more than a dozen or so banks would have failed as a result of allowing Continental to fail. In a report to the same House Subcommittee on Financial Institutions, Supervision, Regulation and Insurance, Congressional staff found that even if Continental's losses totaled 60 percent of assets, only 27 banks would have failed, and only 56 banks would have experienced losses between 50 and 100 percent of their capital, if Continental had been allowed to fail. Using a more realistic, but still high, loss rate of 30 percent of assets, they found that only six banks would have failed, and only 22 would have experienced losses between 50 and 100 percent of their capital, if Continental had been allowed to fail.[7] Nevertheless, it is clear that the FDIC's perception of interbank-exposure risk reduced its capacity to dispose of Continental in a manner that protected only insured depositors.

A Measure of Interbank Exposure in the Fourth District

The measures of interbank exposure that can be constructed from publicly available data are flawed in many ways.[8] Currently, it is not possible to construct measures of interbank exposure that include all of its sources. For the interbank-exposure items that can be constructed, the data are highly aggregated, making it impossible to get an accurate measure of an individual bank's interbank-exposure risk. Therefore, this exercise in measuring interbank exposure in the Fourth District is done with three purposes in mind: 1) to demonstrate how one would go about measuring interbank-exposure risk, 2) to get an overall impression of the level and direction of aggregate interbank exposure in the Fourth District,

and 3) to point out the glaring deficiencies in the data publicly available to construct measures of interbank-exposure risk.

The data used in the study are "call report data" taken from the Federal Financial Institutions Examination Council's Reports of Condition and Income (call reports) from March 1984 through March 1986. This sample period was chosen because there was a major revision of the call reports in March 1984 and because we are interested in the direction of aggregate interbank claims since the bailout of Continental in July 1984.

The banks in the sample are grouped into four subsamples on the basis of the call report forms they file. Banks that file Report 31 are the banks in the Fourth District that have foreign and domestic offices. They also tend to be the largest banks in the District. The remainder of the banks file one of three reports based on asset size: banks filing Report 32 have total assets of at least $300 million; banks filing Report 33 have total assets of at least $100 million, but less than $300 million; and banks filing Report 34 have total assets of less than $100 million. Of the 564 banks in the sample in March 1986, 15 filed Report 31, 39 filed Report 32, 116 filed Report 33, and 394 filed Report 34. In March 1984, 15 of 594 banks filed Report 31, 31 banks filed Report 32, 96 filed Report 33, and 452 filed Report 34.

To measure interbank exposure in the Fourth District, we selected four categories of interbank risk: cash and balances due from depository institutions (CBDI), loans to depository institutions (LDI), acceptances of other banks (AOB), and federal funds sold and securities purchased under agreements to resell (FFS). Our measure of total interbank exposure, TOTEXP, is the sum of CBDI, LDI, AOB, and FFS (see box 1).

TOTEXP is not an all-inclusive measure of interbank exposure, however: it omits potentially important sources of exposure, such as stock and subordinated debt of other banks and loan participations sold with recourse. These and other possible interbank-exposure items were omitted because they are not readily available to us from our data source.[9] Although we missed some interbank-exposure items, we believe that TOTEXP picks up the lion's share of interbank exposure in the asset portfolio.[10]

The banks in the sample are grouped into four subsamples on the basis of the call report forms they file. Banks that file

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We construct the variables in box 1 for the entire sample and for each subsample. The variables are constructed both at the group level and at the individual bank level. The final variables constructed — CBDIC, LDIC, AOBC, FFSC, and TOTEXPC — are the interbank-exposure variables (CBDI, LDI, AOB, FFS, and TOTEXP) divided by total equity capital.

The variables are constructed as ratios of exposure to capital, because the risk we are concerned with here is the risk of capital impairment. The group aggregate interbank-exposure ratios are plotted over the sample period in figures 1 through 5.

Overall, the CBDI exposure of Fourth District banks has fallen since the Continental Illinois crisis. Figure 1 shows that CBDIC in the Fourth District is generally lower in March 1986 than in March 1984 for all five aggregate groups. The decline in the aggregate CBDIC ratios in figure 1 appears to be driven by a shift in the distribution of the CBDIC ratios at the individual bank level. For example, in March 1984, 31.99 percent of Fourth District banks had CBDI exposure exceeding 100 percent of capital, and 10.44 percent had CBDI exposure in excess of 200 percent of capital. In contrast, in March 1986, 25.71 percent of Fourth District banks had CBDI exposure exceeding 100 percent of capital, while 4.97 percent had exposure of more than 200 percent of capital.

Figure 2 shows the pattern of LDI exposure for the Fourth District: LDIC is the highest for Report 31 banks and the lowest for Report 34 banks. From March 1984 until March 1986, LDIC has remained fairly constant for Report 33 and 34 banks, has fallen for Report 31 banks and all reporting banks, and has risen for Report 32 banks.

Figure 3 illustrates the changes in the interbank-exposure ratio AOBC over the sample period. For all of the bank groups, AOBC is a relatively unimportant source of interbank exposure. AOB is less than 10 percent of capital for every aggregate group in every quarter and is lower in March 1986 than it was in March 1984 for each group.

FFSC is plotted in figure 4. As one might expect, this variable shows the greatest variation of all of our interbank-exposure ratios. The seemingly erratic behavior of FFSC may be due in part to

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4. See George J. Benston, Gerald A. Hanweck, and David B. Humphrey, "Scale Economies in Banking: A Restructuring and Reassessment," *Journal of Money, Credit, and Banking*, vol. 14, no. 4, part 1 (November 1982), pp. 435-454.

5. See Edward J. Kane, "Appearance and Reality in Deposit Insurance: The Case for Reform," *Journal of Banking and Finance*, vol. 10 (1986), pp. 175-188.

6. William M. Isaac, Testimony before the House Committee on Banking, Finance and Urban Affairs' Subcommittee on Financial Institutions, Supervision, Regulation and Insurance. *Inquiry into Continental Illinois Corp. and Continental Illinois National Bank*, October 4, 1984 (98th Congress, 2nd session). Washington, D.C.: Government Printing Office, 1985, pp. 457-491.
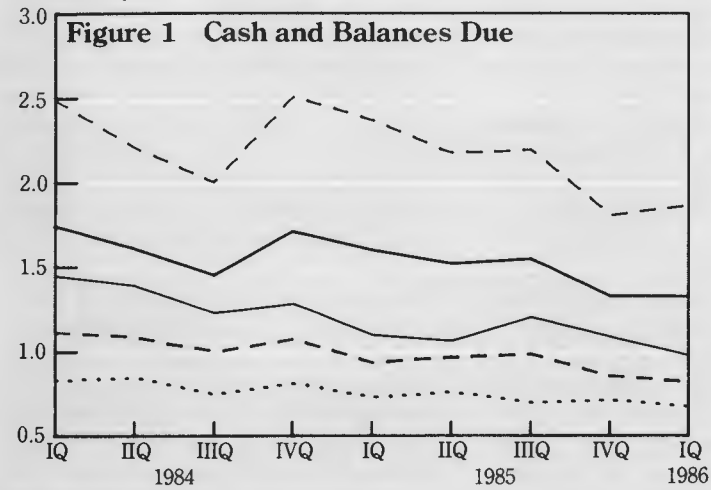
7. See U.S. Congress, Staff Report to the House Committee on Banking, Finance and Urban Affairs' Subcommittee on Financial Institutions, Supervision, Regulation and Insurance. *Inquiry into Continental Illinois Corp. and Continental Illinois National Bank*, ibid., pp. 418-445.

8. Good measures of interbank exposure can be constructed from examination data when the bank examiners specifically seek out this information.
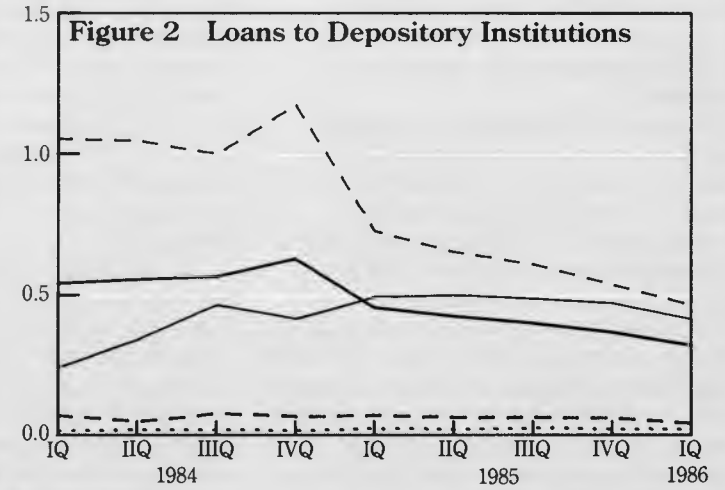
9. Off-balance-sheet risks, such as interest-rate swaps, are additional sources of interbank-exposure risk in the banking system that are captured by the reporting schedules that banks currently file with their regulators.

10. There is a form of interbank exposure (some of it offsetting) on the liability side of banks' ledgers, including, for example, claims due to other banks. Such exposure, also referred to as funding risk, increases the contagion risk of banks' funding sources. For simplicity and manageability, and because funding risk is already a widely recognized and researched problem, we excluded liability items and concentrated on interbank asset exposures only.
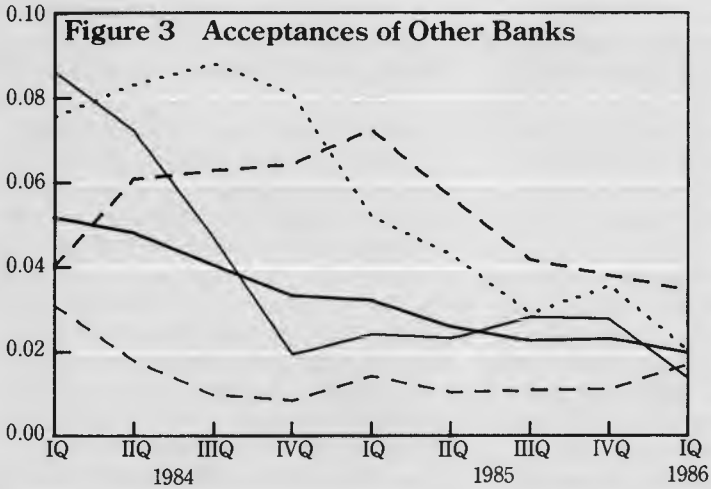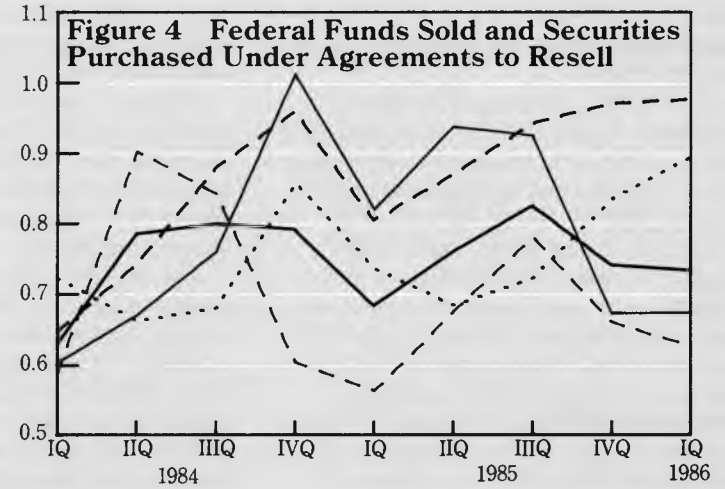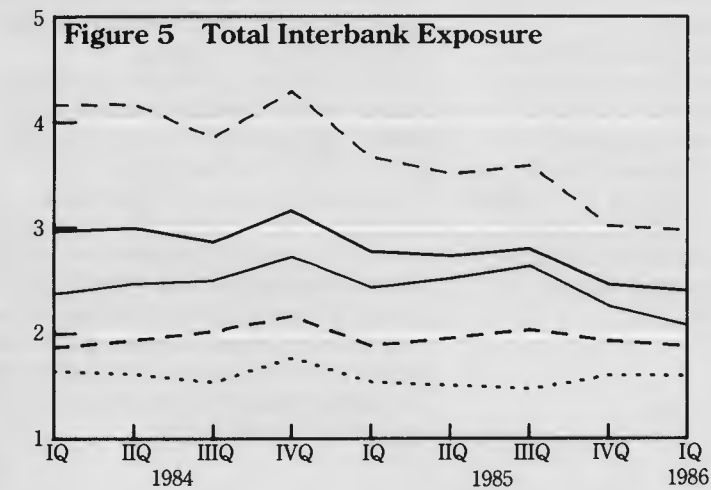
Percent of capital

Figure 1   Cash and Balances Due

3.0
2.5
2.0
1.5
1.0
0.5
IQ   IIQ   IIIQ   IVQ   IQ   IIQ   IIIQ   IVQ   IQ
       1984   1985   1986

Percent of capital

Figure 2   Loans to Depository Institutions

1.5
1.0
0.5
0.0
IQ   IIQ   IIIQ   IVQ   IQ   IIQ   IIIQ   IVQ   IQ
       1984   1985   1986

Percent of capital

Figure 3   Acceptances of Other Banks

0.10
0.08
0.06
0.04
0.02
0.00
IQ   IIQ   IIIQ   IVQ   IQ   IIQ   IIIQ   IVQ   IQ
       1984   1985   1986

Percent of capital

Figure 4   Federal Funds Sold and Securities Purchased Under Agreements to Resell

1.1
1.0
0.9
0.8
0.7
0.6
0.5
IQ   IIQ   IIIQ   IVQ   IQ   IIQ   IIIQ   IVQ   IQ
       1984   1985   1986

Percent of capital

Figure 5   Total Interbank Exposure

5
4
3
2
1
IQ   IIQ   IIIQ   IVQ   IQ   IIQ   IIIQ   IVQ   IQ
       1984   1985   1986

– – – – – Banks filing Report 31
————— Banks filing Report 32
– – – – Banks filing Report 33
·········· Banks filing Report 34
————— All reporting banks

SOURCE: Federal Financial Institutions Examination Council's
Reports of Condition and Income.

the short maturity of FFS assets. Because FFS tend to be very short-term assets, the numbers reported on the day of the call report may not be representative of the true FFS position of the banks in the sample.[11]

Although this problem may influence the numbers, it should not dominate the trends for the groups or for individual banks. It is more likely that the movements in the FFSC over time are driven by interest rates and by the availability of profitable investment opportunities in securities and in the banks' home markets. The trend upward for the Report 33 banks since March 1985, and for Report 34 banks since June 1985, may be due to the second factor. That is, the decline in interest rates that probably is driving down the exposure for the Report 31 and 32 banks is dominated by the reduction in profitable investment opportunities for small banks in their local markets.

TOTEXPC, the sum of the specific interbank-exposure ratios, is plotted in figure 5. TOTEXPC follows the same pattern as CBDIC for all of our aggregate bank groups. Overall, TOTEXPC has fallen for the largest banks in the Fourth District (Report 31 and 32 banks) and has risen slightly or stayed the same for the small banks in the Fourth District (Report 33 and 34 banks). The decrease in TOTEXPC for the large banks tends to reflect a decrease in CBDIC, LDIC, and FFSC over the sample period. For the small banks, the rise in FFSC offsets decreases in CBDIC and LDIC.

One problem with using group data is that group trends can be dominated by the behavior of a small number of banks. To find out if this is a problem, we examined the trends in interbank exposure using individual bank data. For all of the interbank-exposure categories, this analysis supports the conclusions drawn using the groups.

Before one reads too much into the relationships in the figures, we must point out several caveats with the results. First, the numbers reflect the aggregate inter-

bank exposure and do not take into account possible diversification of the exposure. A bank could have a very high exposure to other banks in the banking system, but very little exposure to any one bank. Such a bank would have less interbank-exposure risk than a comparable bank with less exposure to the banking system, but with a high level of exposure to a single bank or to a small group of banks.

Second, with currently available data, we cannot determine riskiness of the interbank claims. There is less reason to be concerned about a bank's interbank exposure to a sound and conservatively managed bank than the same level of exposure to one of the "high fliers" of the banking or thrift industries. Third, interbank claims on the liability side of the balance sheet offset some of the asset exposure. Finally, we cannot determine the duration of the exposure. Banks with a high level of interbank exposure concentrated in assets with very short maturities have less interbank-exposure risk than banks with the same level of interbank exposure concentrated in assets with longer maturities.

Overall, interbank exposure, as defined in this study, does not seem to be a problem for banks in the Fourth District. Aggregate exposure ratios, as well as the majority of individual bank exposure ratios, do not appear to be at levels that are high enough for concern, and there is a general downward trend in our measures of interbank exposure for banks in the Fourth District as a whole.

However, as we readily admit, the measures that we are able to construct from call report data are so crude that our interpretation of the results is based more on instinct than hard evidence. On the other hand, it is clear from our study that a few banks in the Fourth District have an aggregate interbank exposure high enough to warrant closer scrutiny at the time of their next examination.

Conclusion

Interbank exposure is a form of contagion risk that has significant public policy implications for the safety and soundness of the banking system. We present arguments and anecdotal evidence supporting two basic hypotheses. The first is that high levels of interbank exposure reduce the safety and soundness of the banking system. This contagion risk increases the probability that a single bank failure, or the failure of a limited number of banks, would result in a series of bank failures.

Our second hypothesis is that interbank exposure affects the ability of the FDIC to use market discipline as a constraint on banks' risk-taking. A reduction in the independence of bank failures increases the constraints on the FDIC's ability to dispose of insolvent banks without extending forbearances to the bank's uninsured depositors, general creditors, and stockholders.

Our analysis suggests that the federal banking regulators should place more emphasis on improving the measurement of interbank exposure, and should analyze more carefully the relationship between this exposure and the health of particular banks in the banking system. Currently, the most detailed information about interbank exposure comes from bank examination data. By modifying call reports or setting up a separate reporting schedule, interbank exposure could be used as part of an early-warning system to trigger bank examinations. Obviously, extensive research should be done before any regulatory limits are developed for interbank exposures of various kinds.

This *Economic Commentary* presents a measure of interbank exposure for banks in the Fourth Federal Reserve District from March 1984 until March 1986. Interbank-exposure ratios formed on aggregated data indicate that the overall level of interbank exposure in the Fourth District has declined from March 1984 to March 1986. The same ratios formed on an individual bank basis support this conclusion. Overall, the evidence suggests that interbank exposure is not a serious problem in the Fourth District.

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11. A possible solution to this problem is to use the quarterly average FFS position of the bank from the call reports.

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